Public library mobile apps in Scotland: Views from the local authorities and the public

Purpose – The purpose of this research was to examine current public library apps in Scotland and assess Scottish public library users' opinions of those apps.

Design/methodology/approach – Two qualitative and quantitative surveys were conducted. One survey was distributed to each Scottish Local Authority, the entities responsible for public libraries in7 Scotland. The second survey was made available to the public. The results were analysed with nonparametric statistics and content analysis.

Findings – All 32 Authorities responded. Seventeen Authorities had an app, two had one in development, and 13 had none. Offering an alternative means of communication to patrons was the main reason for providing an app, while cost and low priority were the main reasons provided against app provision. Authorities were satisfied with the core services offered in their apps, but less so with others. No Authorities had consulted the public regarding app provision. The public (n=185), while satisfied with current library apps, criticised the complex procedures required to access external services. Patrons from Authorities without an app stated interest in apps.

Practical implications – It is vital for public libraries to implement at least core services that are optimised for mobile devices. They should consult with the public before and throughout the development process to ensure they are happy with the implementation.

Originality/value – This is the first known study to explore public library app use in Scotland as well as one of the first in public library app use worldwide.

Introduction and Literature Review

Scottish public library services are solely the responsibility of the thirty-two Local Authorities and have a statutory duty to secure the provision of library facilities for their residents. These Authorities ranged from suburban city councils (e.g. Edinburgh City Council or Glasgow City Council) to widespread and remote areas e.g. Shetland Islands Council or Dumfries and Galloway Council. Libraries clearly now require an internet presence, but debate remains on whether a dedicated mobile app or a website optimised for mobile use is best. Data from the USA estimates that mobile users spend over 80% of their time on a core set of apps and 20% on a mobile internet browser (Spence, 2014). This suggests that possibly having simple online access to a service is insufficient; perhaps a dedicated app is necessary to engage library patrons on their mobile devices. Libraries compete with the likes of Twitter and Facebook for their patrons' attention. The public is increasingly accustomed to constant access to services in both time and place, so it behoves libraries to cater to this expectation. Libraries must reconsider how they decide what services they provide by learning what the public wants, rather than deciding on their own and then expecting the public to accept the services provided.

The rapid adoption of smartphone and tablet technologies presents public libraries with the challenge of incorporating them in a safe, secure and effective manner. The fusion of smart and mobile technologies allows handheld devices to displace deskbound computers and laptops. Tablets and mobiles combine small size with improved battery technology, allowing internet access anywhere. Minimal infrastructure and affordability of Wi-Fi and 4G networks has produced global networks accessible across the economic spectrum. Mobile ownership in Kenya was 82% versus 89% in the USA in 2014 (Pew Research Center, 2015). An app extends the library's reach, crossing cultural and economic boundaries. In 2015, 63% of adults in Scotland owned a smartphone and 4G uptake rose by 25% 2014-2015 to 55% (Ofcom, 2016). Approximately 50% of Scots make use of public libraries, most prevalently families with primary school age children and those not working full-time. 77% of Scots consider public libraries as important to their community (Peachey, 2017). Portable, multifunctional devices allow for new types of interactions, such as Quick Response (QR) code and barcode scanning, RFID technology adoption and other self-services within libraries. Other new capabilities, like voice recognition and iris scanning, will be readily

available through smart devices. Pressure on libraries to incorporate these developments will only grow and delaying implementation risks adding to the view of the library as outdated.

Despite the proliferation of smart and mobile technologies, little is known about the implementations and perceptions of them within public library settings. This study was the first to inspect mobile app services in public libraries across Scotland, review public opinions of them, and ask what services should be provided within them. The Scottish Local Authorities, which comprise the council areas that fall under the Scottish Government, were invited to complete a survey about public library app provision within their area alongside a public survey to determine Scottish library patrons' opinions on apps. The Scottish Authorities Survey received a response from all 32 areas, and the public survey received 185 responses.

Library 1.0 – 3.0

Library 1.0 has been described as "a linear management model mainly aiming at literature resources. And the professional work consisted mainly gathering, processing, managing, storing and utilizing printed literature" (Yang et al., 2009, p.284). It is a mind-set whereby library services are provided in a top-down manner with emphasis on resource management.

Library 2.0 is distinguished from Library 1.0 by being user centric, socially rich and communally innovative. This rapid change in the role of the librarian coincided with a spurt in Web development allowing the library to continue evolving as technology changed. As Maness concluded: "Web 2.0 is an early one of many [forms of the Web], libraries must adapt to it, much as they did the Web originally" (Maness, 2006). Library 2.0 impacted upon library services and their provision, ranging from the implementation of e-learning (Huang, 2015), library communication with patrons (Walia and Gupta, 2012) and the provision of materials in digital format (Martindale et al., 2015). The era of Library 2.0 brought an appreciation for the different ways information can be viewed, presented and manipulated. Simultaneously, the quantity of information now available made librarians aware of the need to teach information literacy and help users handle information constructively. The librarian's role was now in facilitating users' information needs rather than guarding library resources.

Fiander discusses use of social media sites, how they differ, the advantageous applications of such sites and advice on setting up institutional profiles (Fiander, 2012). He emphasises that administrators need specific policies regarding library conduct on social media platforms. These must provide sufficient guidance to staff with inbuilt flexibility to permit a direct response. Points included:

- Blogs – Use a institutional web address, not a blog server address, this looks more professional and obviates the need to change address if the server is changed.
- Twitter – Primarily a customer service medium, for service announcements, event promotion and collecting customer feedback. Library staff require permission to respond to observed comments, assuring the commentator that they have been acknowledged. Two-way communication should be encouraged.
- Facebook – A community marketing tool, not a monthly newsletter and needs to be updated frequently. Successful profiles take time and attention. Library events should be added as Facebook events, allowing the public to indicate interest and share them with their friends.

Implementing the tools from Web 2.0 and the philosophy of Library 2.0 into a library requires imagination, planning and a commitment of resources. The British Library has developed YouTube clips to augment its current exhibitions (The British Library, 2016). The National Library of Scotland uses Facebook to promote its special collections and facilitate dialogue with its patrons (National Library Of Scotland, 2016). The Glasgow Women's Library runs a popular blog from its library website following events at the library (Glasgow Women's Library, 2016). These illustrate use of Web 2.0 resources to augment library services.

Web 3.0 brings opportunities for the evolution of libraries and librarianship; this has been labelled as Library 3.0. Kwanya proposed the following main principles. The library is intelligent, organised, a federated network of information pathways, apomediated and is 'my library' (Kwanya et al., 2012). Library 3.0 aims to connect users with multiple sources of information. Linked databases can consult each other to open information access and provide a personalised experience for each individual based on past history. These services would

encourage more community participation with the library, enabling global participation as well as local. The role of the librarian in Library 3.0 has moved on from the shelf stacking and book stamping of Library 1.0, to handling information in multiple formats, with the aim of providing information to all. This requires training the librarian in the use of the latest technologies in order to facilitate the patrons' independent use of those same technologies. A lynchpin of Library 3.0 is the interconnectivity of systems, databases and the ability to recognise individual patrons. Incorporating context-awareness technology into the library system works towards an intelligent library tailored to each individual. This was summarised by Noh as:

> . . . seamless use of technology, providing the information and services desired by users by combining the users internal and external contextual information such as users' preferences, history, behaviour, and the current time and place in an optimised environment, will be the future of the next generation of digital libraries (Noh, 2013, p.237).

Though different definitions exist, consensus is that the main aims of Library 3.0 are "to establish a semantic relationship between all available Web contents to ensure seamless accessibility, search-ability, availability and usability" (Chauhan, 2009).

Just as the introduction of social media networking to the library inducted Web 2.0 technology into the library service, a library app is a step towards Library 3.0 and bringing in Web 3.0 technology such as recommender functionality, cloud-based services and natural language search capability.

Mobile App Provision in Libraries

While access to internet services has been prioritised by public libraries, the same cannot be said for mobile technology. Little published research exists in this area. Given that apps have been linked to positive perceptions and general contentment (Linnhoff and Smith, 2016), libraries would benefit from providing such a service to a population increasingly using mobile technology (Barkhuus and Polichar, 2011). Academic and specialist libraries first investigated demand for apps (Ballard and Blaine, 2013), with survey results on app usage (Liu and Briggs, 2015). Preferences for library app functionality as reflected in the research were as follows:

1) Search the catalogue
2) Acquire library contact information
3) Search databases
4) Renew book loans
5) Access patron accounts
6) Order inter-library loans

Other desired library app services include access to e-books, e-audio, music and video, marketing for local and library events through a calendar, links to government facilities, health services (Ashford and Alex, 2013) and a self-checkout system, based on radio-frequency identification (RFID) technology (Ong *et al.,* 2014). Smart technologies such as QR codes could provide a large range of self-service options to patrons (Craig, 2012). The implementation of technologies such as these would streamline the user experience and have positive implications such as financial savings and out-of-hours access. An important aspect of any app is the ability to monitor usage to inform service development. Basic statistics include hit counts on each service, download numbers, visit duration and type of device used to access library services. Another consideration is the library as a platform for third party apps.

Another consideration is whether to programme the app in -house or to employ an app developer. The former requires a full-time specialist to monitor and update the service, while the latter requires the payment of fees and relinquishes control of the app to a third party.

Finally, libraries must consider whether they will develop a native app or simply a website with responsive design. While it is useful for library services to implement responsive design into their website, there are advantages for libraries in creating a native app that can make full use of the inbuilt capabilities of a mobile device. For example, an app can use the camera to scan a barcode to search the library catalogue from anywhere or to turn the device into a replacement library card, allowing items to be checked out. Initially, the introduction of responsive design to the website is cost effective and technically simpler than producing an app; however, the inability to make use of the more innovative functionalities offered on mobile devices will increasingly expose its more limited capabilities. Essentially, a native app can do everything a responsive website can but not vice versa.

Methodology

This research sought to ascertain the extent to which apps have been introduced into Scottish public library services as well as to gather official and public opinions about them. One survey was targeted at Local Authorities due to their responsibility for public libraries in their areas. In parallel with this, public opinion was sought to determine the success of app implementation or the degree of demand for such a service. This was collated through statistical analysis of ordinal responses and the content analysis of textual responses. With little previous research in this area, high uncertainty and no historical data with which to compare results, a range of qualitative and quantitative responses were elicited in order to begin an understanding of the different perspectives on apps from both local authorities and the public (Sofaer, 1999).

Data Collection

Examples using surveys to obtain similar information were examined (Kumar, 2014, Canuel and Crichton, 2015, Becker *et al.*, 2013, Mills, 2009). This helped with phrasing questions and determining survey length. Questions were asked in ways that maintained anonymity, with opt-out options available. In both surveys, the only compulsory response was to identify with which Authority the respondent was associated. The Likert scale was used as it allowed a neutral and nuanced response from the respondent. Given the lack of previous research in this area, high uncertainty and no historical data with which to compare results, a range of responses were encouraged through open-ended questions. Both surveys allowed respondents to express other opinions in textboxes. Authorities without an app were asked different questions from those with an app. Members of the public whose Authority had no library app or were unaware of its existence were asked different questions from those with access to and knowledge of a library app.

With regard to question and answer types, textboxes encourage spontaneous response, though this complicates analysis and should be avoided. Restricted choice in closed questions, should include “Other” and “Don’t know” options to provide a full range of responses. Use of filter questions avoids presenting irrelevant questions. Long list responses can lead to bias, as respondents tend to choose what they initially see rather than hidden options, drop-down

boxes were preferable. Thought was given to question order, with topics grouped together and easily answerable factual questions at the start to encourage survey completion.

The only feasible way to gather the required information across the target area within the required time-scale was by online survey. Qualtrics was used for survey creation, distribution and initial analysis. The first survey was aimed at Authorities to determine app presence and investigate factors surrounding that decision. The second survey targeted the public to ascertain awareness of library apps, appetite for library apps and services expected from such apps.

Invitations were sent by email and through social media. As contact details were received from each Authority, an introductory email explaining the purpose of the study was sent requesting that they fill in the Authorities Survey. A second email was sent containing a link to the Public Library App Survey, a printable poster advertising the public survey with a request to promote the public survey through social media. These recruitment methods allowed data collection from across Scotland at no cost. However, associated limitations included unequal internet provision, no control over how the libraries promoted the surveys to their patrons and lack of control over who responded, potentially distorting survey results. The target audience was restricted by the digital nature of the survey with individuals less comfortable with technology unlikely to reply, leading to a self-selecting sample.

Data Analysis

The methods selected for data analysis were the Mann-Whitney U test for the quantitative data (Nachar, 2008) and content analysis for the qualitative data (Hsieh and Shannon, 2005).

Since the quantitative data was not normally distributed and therefore not conducive to treatment by parametric methods, as it does not follow any standard distribution, a nonparametric test was employed. The Mann-Whitney U Test was deemed to be appropriate for this purpose, mainly because it makes no assumptions relating to distribution. The probability was obtained from correlation tables using a 0.05 two-tailed test to obtain the critical statistical test value, and by comparing this with the lowest U value from the samples, it was possible to determine the validity of the null hypothesis. The null hypothesis was that the two population samples were statistically similar.

Content analysis is a technique used in research when responses are varied and unrestricted in length or control, often used in situations where respondents have distinctive reactions, memories or opinions and used in market research, health services and mass communications. The main principle of content analysis is the identification of emergent themes and key concepts, sorting these into categories and establishing relationships. Styles of content analysis include conventional, directed and summative. It can be qualitative or quantitative. Since there was no relevant literature for comparison, directed content analysis was not possible and since the majority of textual responses were concise, summative analysis was not viable. Therefore, a conventional content analysis approach was adopted, in which response frequency in the various categories indicate importance to the survey respondents. Categories are grouped into a hierarchical schematic illustrating relationships and relative importance (Hsieh and Shannon, 2005).

Results

Scottish Authorities Survey

Of all 32 Scottish Authorities contacted, 33 complete responses were returned. One Authority returned two responses which have been merged and one gave a partial response. The responses are considered a true reflection of Authorities in Scotland, since all responded. Twelve Authorities provide their own library app, five provide an app in conjunction with another enterprise, two have apps in production, and thirteen have no app. For those not providing an app, frequent reasons included budget constraints, low priority, and waiting to see what other authorities do first. Authorities providing an app are primarily doing so to connect with patrons and to acknowledge the need for modernisation.

The Authorities operating in conjunction with another enterprise are geographically close but do not work cooperatively with each other. There appears to be no connection between population density or internet accessibility and app provision. Figure 1 demonstrates the geographical spread of library app provision by Scottish Authority.

Figure 1. Geographical spread of library app provision, by Scottish Authority

No Authority had previously conducted a survey on public attitudes on library apps or whether their app services were considered useful. Two Authorities stated that a survey was under consideration. Regarding app promotion within the Authorities, 14 confirmed active app promotion, and four had promotional plans in development. The most frequently mentioned themes within app promotion were websites, social media, hard advertising, soft advertising, events and staff awareness.

Seventeen Authorities responded when asked what services they provided through their app. The most commonly named services included traditional library services such as location information and opening hours, catalogue access, and account access, but many others were listed as well. See Table 1 for a complete list.

Table 1: Services that Scottish library apps provide.

Seven Authorities provide a service through their app not listed as an option in the survey question, nine would like to provide services listed in the survey but currently do not, and twelve kept track of app usage and performance statistics, such as those provided by the app supplier, number of installations, number of launches, and run time length.

When asked whether apps were an important part of library services, 30 Authorities responded; 16 said definitely, 11 said probably, 2 said maybe, and 1 said probably not. 15 Authorities left additional comments, including: “Our app supplier offers poor support and more could be achieved if service was improved” and “The current library app could be improved to make integration between third party services more streamlined for the user. For example, we are working towards a single sign on for all services via the app”.

Public Library App Survey

From the public survey, the researchers received 185 responses across the Authorities. Amongst the Authorities, three had zero public responses, fifteen had 1-4 responses, ten had 5-9 responses, one had 10-20 responses and three had 20+ responses. The largest number of responses from any single Authority was 27. 141 respondents were female, 39 respondents were male and three did not specify a gender. Age ranges extend from 16–19 at the youngest to 60+ at the oldest. To check the validity of the public respondents as representative of the

general public, the Mann-Whitney U test was calculated comparing age range with the national register as of 2014 (National Record Of Scotland Web Team, 2016). This showed no statistically significant difference.

Respondents were asked if they had access to a smartphone or tablet. 115 had both, 50 had a smartphone only, 11 had a tablet only, and eight had neither. When asked if they would use smartphone or tablet technology from the library, 108 said yes, 29 said possibly, and 46 said no. 94 said they knew their library offered an app, 26 said their library did not provide an app, and 65 were unsure whether there was an app. Of those who had used the library app, 85% used it to search for a book, 70% renewed an item, 68% reserved an item, and 49% searched for an e-book. Asked how often they manage to complete their task on the library app, 76 replies were received; 18 said always, 46 said regularly, seven said occasionally, and five said rarely or never.

When rating app satisfaction, 77 responses were received; 49 were satisfied, 13 were slightly satisfied, nine were neutral, and six were slightly dissatisfied or dissatisfied. A Mann-Whitney U test comparing Authority opinion on app usefulness to public app satisfaction showed no statistically significant difference. When asked what unavailable services they would like on the app, 74 responses were received. From the 16 respondents who said “yes”, most mentioned core library services such as account details, self-check, and loan history.

Asked what features an app needs to be useful, 82 comments were left, ranging from “Easy use” and “Don’t really know” to “renew books, change personal details, check what I currently have on loan, look up stock and reserve items, alerts when items are available” and specific requests like “Access to dyslexia friendly stuff as I have a dyslexic child”. Mann-Whitney U tests were performed to gauge the similarity of the “Has App”, “No App” and “Unaware” populations. This showed no statistically significant difference. Asked if they would recommend the library app to others, 81 respondents replied; 63 said yes, 14 said maybe, and 4 said no.

185 respondents left general comments about library apps. 52 replies were left in response to this prompt ranging from “No” to “Ensure that there is a Windows version as well and Android/iOS” and “I find them a useful, easy way to access library services”. More comments (27) were positive than negative (15), although some had no comment about it

(15). Positive comment themes focused around the use of library functions within the app. Negative comments were drawn from negative opinions of the app's functionality.

Discussion

Authorities Survey

Most Authorities are satisfied with the apps' core services. Difficulties arise with external services, e.g. Zinio, ProQuest or Overdrive. The app is often hindered by multiple login screens and password prompts which is off-putting. One participant commented: "The current library app could be improved to make integration between third party services more streamlined for the user. For example, we are working towards a single sign on for all services via the app." Key to library apps is stability, intuitive navigation and uninterrupted action.

There was agreement on essential service provision: the ability to reserve and renew items, catalogue access and library locations. All but one Authority provided opening hours. Approximately two-thirds of Authorities offered access to e-services and many Authorities selected "Under Development" here, reflecting difficulties in integrating these satisfactorily. Under three-quarters said that their app linked to social media. As patrons spend inordinate amounts of time on these platforms, these links should be available. Only ten Authorities linked to library events and eight to local events. Potential services, like inter-regional loans, links to government services and links to national institutions, were not priorities; no Authority provided them. It was noted that no mention was made of developing enhanced functionalities such as recommender functionality, QR code scanning, self-checkout, natural language search capability or community participation. New functions like these are significantly easier to implement in an app than through a website. Links to reliable sources of information and support like the National Eczema Society or Dementia UK were almost absent. Libraries could direct patrons to trustworthy information, thereby potentially increasing app usage.

16 of 18 Authorities cited improved connection with patrons followed by the need to modernise as reasons for app provision. Finance was mentioned by seven Authorities having received external funding to develop their app. The Society of Chief Librarians in England

acquired funding from the Arts Council, Barclays and The Wellcome Trust for digital development in libraries (Sinclair *et al.*, 2016). Similar initiatives could be pursued in Scotland.

No Authorities had ascertained the public's view on library apps, suggesting a lack of forward planning. A simple online questionnaire could be developed to gauge patrons' interest, producing valuable data to inform future policy and implementation. Two-way communication is a key feature of Library 2.0 and 3.0 and should be indigenous to library services.

The number of Authorities not providing an app is crucial to consider, since others have provided them since 2012. Clearly, different indicators exist for viewpoints on library services. One argument is that mobile-enabled websites are sufficient for patrons' needs; therefore, an app is unnecessary. A mobile-enabled website with adjustable screen size, side-ways navigation, up-down navigation and touchscreen capability would be a fair compromise accessible across all platforms. However, a website not fulfilling these criteria is not suited to smartphones or tablets. Dedicated apps can provide one-tap access, use of HTML 5, a cache ensuring a stable experience, and the potential to implement future technological developments (Gibbs, 2015). The commercial sector is increasingly focusing on smart technology to interact with customers. Libraries must match this in every way, and provide the service patrons expect. Having a library app is about future-proofing and being in the pocket of every patron.

A second important issue is the quality of app service, access to resources and stability, which were highlighted as reasons for delaying or not implementing an app. These difficulties were also reflected by some Authorities providing app services: "When you have an app created by an outside company, you are reliant on that company to make any changes or tweaks to your app. In our experience, this has been the most disappointing aspect." There was a sense of frustration in persuading suppliers to improve functionality in ways the library would like and know apps can handle. One way to enhance influence would be for Authorities to combine resources, similar to the scheme initiated by the Scottish Consortium of Public Libraries (SCoPL) for a Library Management System which awarded a contract to Civica in 2015 (Merrett, 2016). A coordinating team in charge of national app development, responsible to all Authorities, would remove the need for individual app development,

benefiting all areas, especially smaller library services struggling to afford specialist staff. Side benefits include inter-authority loans, spreading information and ideas of best practice. One Authority raised security as a reason for not supplying an app but was not specific on the exact problem. While important, other Authorities have found appropriate means to maintain security.

With libraries under pressure, statistical evidence showing footfall needs to be gathered. Not all Authorities received statistics on app usage and were not aware of which services patrons used: "…do not provide regular usage info and we do not have direct access to any analytics". Another said, "It [usage statistics] isn't measured." A third one reported, "We have access to usage statistics via the library app admin interface which is collected quarterly." Monitoring this data should be a basic provision of the app's configuration. Analysis of these statistics determines how successfully patrons can access services. Problems would be highlighted as patrons stop using inaccessible services. Some Authorities get more comprehensive service from their app provider than others. It was unclear from the survey why this was so.

Public Library App Survey

The Mann-Whitney U test confirmed that the age spread of the sample population was not significantly different from the general population. 185 is too small a sample from which to draw any statistically significant conclusions. Comparing results with the national survey of smartphone ownership, the younger age groups, 16-19 and 20-29 and the 60+ age group were under-represented while middle age groups were over-represented. Older age groups may be stereotyped as less digitally enthusiastic than the younger groups. This result may indicate a disconnect between libraries and these age groups. These groups include new parents; maintaining the importance of libraries in the life of young families cannot be overstated.

The gender ratio of respondents was approximately 20:80 male to female. This is clearly different from the national figures, ~48:52. The gender ratio of library patrons is unlikely to be as extreme as the ratio produced by the survey. Three explanations for this imbalance are possible.

1) A flaw resulting in significantly fewer male respondents, due to reliance on volunteers. Direct methods like interviews or face-to-face questionnaires produce a more balanced set.
2) Male patrons are less amenable to answering survey questions, though little evidence supports this.
3) The patron population could have a heavy gender imbalance and the respondents reflect this. If true, it highlights a major problem for the service, implying a disconnect between it and many potential patrons.

In all likelihood, a combination of factors led to the gender imbalance. The lack of basic information on active library patrons must inhibit the future planning of library services.

Mobile ownership was as expected as the survey subject involved smart technology. The majority of the respondents owned a smart device; most owned a tablet and smartphone. This strengthens the case for an app as smart services proliferate and public expectations evolve.

Asked if they would use smart technology from their library, approximately 75% said "yes" or "possibly" while 25% said "no", indicating service potential with current patrons. There is not the same drive within libraries to provide access to smart services compared to computer and internet access. Though many patrons own smart devices, that so many indicated interest in seeing them at the library shows an unfilled demand. The library could run classes on using this technology with sessions where patrons bring their own device, if the library is concerned about providing equipment. As smart technology becomes ingrained in society, those without access or ability to use it will be disadvantaged. This is where the library intervenes. As resources become redundant they can be replaced with smart devices, gradually introducing access.

Closer examination of respondent awareness of app services yielded the following:

- 5 falsely said yes.
- 3 falsely said no.
- 18 said unaware instead of no.
- 47 said unaware instead of yes.

Those who falsely replied yes could be mistaking a mobile-enabled website for an app. It is understandable that respondents from areas without an app were uncertain how to respond and thus chose "unaware". The fact that 50 of 185 did not know that there was no app available when there was one indicates a need for better promotion. This appears to show a lack of connection between library services and patrons. Libraries must be proactive to maintain their impact and relevance.

App users were highly positive about their library's app, with 78% rating it as either "satisfactory" or "very satisfactory". With similar scores for layout, navigation and services offered, reasonable standards of design and functionality have been achieved. That no one rated the apps as "very poor" is encouraging.

App usage revealed the most used app aspects with 78 of 94 responses. These were the core services: catalogue searching, loan renewal and item reservation at 85%, 70% and 68% use, respectively. Searching for e-books was at 49% with only 67% of Authorities offering access, showing demand for this service. Other minority services included e-magazines, access to online databases and information on local and library events. 67% of Authorities provided access to e-services and 55% on library events, yet 24% of respondents had used the app to look at library events compared to 23% who used the app for e-magazines, indicating high demand for library event information or depressed usage of e-magazines, warranting investigation. 11% of respondents had accessed research databases even though only 44% of Authorities provided access. While relatively small, this shows that databases are valuable additions, providing information to the public. As subscription services are prepaid, providing as many gateways as possible makes sense and optimises value.

That 84% of respondents "regularly" or "always" achieve their goal, reflecting strong app performance. Three respondents selected the most negative option: "never". Though small, this shows a minority of patrons who encounter difficulties. An unknown number of patrons may have had similar experiences but not voiced them. Libraries must encourage users to report problems and not assume that no reports mean no problems.

The Mann-Whitney U test comparing public satisfaction against Authority opinion on app usefulness indicated similar opinions. 64% chose the most positive category to describe their

app experience, some selected a negative response. Libraries need to investigate, analyse causes and resolve issues wherever possible.

Librarians and IT staff are aware of app potential beyond core services, but this cannot be said for the public, as those who used library apps had only a few suggestions:

- "suggest a book for purchase if not in stock",
- "clubs & organisations" and
- "reminder of due dates for return".

Those without apps emphasised core services:

- "reservations renewals, library card, reminders, branch times",
- "alerts to new books, book renewals and e-book access" and
- "find, reserve, renew books."
- "Pay account charges (fines, hires etc.). Book tickets to events. Download e-books, e-audio and e-magazines. Book reviews."

Access to additional information on items, such as a synopsis, reader reviews and library recommendations was mentioned. One parent stated, "ability to control multiple accounts – e.g. my own AND those of my children who I am counter signatory for". While understandable, this presents technical and legal difficulties.

Access to specialist and resource materials was another area of interest:

- "accessing databases e.g. family history resources" and
- "access to dyslexia friendly stuff as I have a dyslexic child".

This mirrors Authorities' desire to expand app functionality and demonstrates the public's desire for services beyond the core ones, like "self-service options", "get me straight into every online service without passwords" and "Ensure that there is a Windows version as well as Android/iOS", supporting Authorities investigating these functions.

The survey highlighted public unfamiliarity with library apps:

- "I am not aware of such apps being widely available; are they advertised?" and

- "I am unfamiliar with library apps. This survey has made me wonder what apps are available from the library", indicating that libraries must work on app promotion.

Support was expressed for library apps as well:

- "I think they should be an integral part of any library service in this day and age" and "I'd use one if there was one."

Others had specific complaints:

- "I can't scroll down the list of libraries in ‘My Local Library'. It stops after [branch name]!" while one commented:
- "soulless & pandering to the ‘now, I want it done now or I don't want it at all' section of society".

Successful implementation was indicated:

- "So easy to reserve books – absolutely brilliant. People in my book group buy books but I just search and reserve at the library" and
- “I find the library app very useful, I use it quite often and have become so used to it that I'd really miss it if it was discontinued."

75% of respondents said they would recommend their library’s app, so overall they appear well-regarded.

Conclusion and Recommendations

In conclusion, 40% of Scottish Authorities have no intention of providing a library app, with the distinct possibility that their libraries may become irreparably disconnected from significant portions of potential patrons. This contradiction between ‘have’ and ‘have not’ cannot be good for the library service. Considering the growing number of available apps and their range of functionality, there will be an ever-widening gap between those with access and skills to use them and those who do not. There is not the same impetus to provide access to smart technology as there was to computers and the internet. Design mechanics are

common to all library apps and do not need to be individually produced, cooperation between Authorities on a common system would benefit all.

Lack of public consultation over matters such as the library app is disappointing and is reminiscent of Library 1.0. Patrons are a rich source of ideas for improvement. Sustained advertising need not be expensive; poster campaigns or asking if patrons have tried the app can suffice. Greater effort should be put into communication between Authorities and with patrons. Libraries are challenged with Authorities under financial constraint, a commercial sector increasingly encroaching upon information and leisure services and a segment of the population who regard libraries as obsolete. Apps have a definite role to play in meeting these challenges by promoting increased use of library services. By using an app instead of a mobile-enabled website, all the functionalities of smart technology can be incorporated to the libraries advantage. Improved communication with patrons increases exposure to communities who otherwise would not use library services.

Now that this study has established a baseline, future research should include more in-depth interviews with those responsible for library app provision as well as library app users in order to gain a stronger understanding of the development, perceptions, and use of library apps. It would also be useful to compare the results from this Scottish study to responses from other geographic areas.

Works Cited

Ashford, R. and Rolfe, A. (2013), "Serving your mobile users: the essentials", in Peters, T. A. and Bell, L. (Eds.), *The Handheld Library: Moblie Technology and the Librarian*, Libraries Unlimited, Santa Barbara, CA, pp. 3-11.

Ballard, T. L. and Blaine, A. (2013), "A library in the palm of your hand", *New Library World,* Vol. 114 No. 5/6, pp. 251-258.

Barkhuus, L. and Polichar, V. E. (2011), "Empowerment through seamfulness: smart phones in everyday life", *Personal and Ubiquitous Computing,* Vol. 15 Iss. 6, pp. 629-639.

Becker, D. A., Bonadie-Joseph, I. and Cain, J. (2013), "Developing and completing a library mobile technology survey to create a user-centered mobile presence", *Library Hi Tech,* Vol. 31 No. 4, pp. 688-699.

Calacanis, J. (2016), "Web 3.0, the 'official' definition", available at: http://calacanis.com/2007/10/03/web-3-0-the-official-definition/ (accessed 2016).

Canuel, R. and Crichton, C. (2015), "Leveraging apps for research and learning: a survey of Canadian academic libraries", *Library Hi Tech,* Vol. 33 Iss. 1, pp. 2-14.

Chauhan, S. K. (2009), "Library 3.0", Available at: http://key2information.blogspot.co.uk/2009/09/library-30.html (accessed 24 November 2016).

Fiander, D. J. (2012), "Social media for academic libraries", in: Rasmussen Neal, D. (Ed.), *Social Media for Academics: A Practical Guide*, Chandos Publishing, Oxford, pp. 193-210.

Gibbs, S. (2015), "Iris-scanning smartphone puts paid to passwords in blink of an eye", available at: https://www.theguardian.com/technology/2015/may/14/iris-scanning-smartphone-fujitsu-ntt-docomo-passwords (accessed 2016).

Glasgow Women's Library (2016), "Blog | Glasgow Women's Library", available at: http://womenslibrary.org.uk/category/blog/ (accessed 24 November 2016).

Hennig, N. (2014), *Apps for Librarians*, Libraries Unlimited, Santa Barbara, CA

Hsieh, H.-F. and Shannon, S. E. (2005), "Three approaches to qualitative content analysis", *Qualitative Health Research,* Vol. 15 No. 9, pp. 1277-1288.

Huang, T.-C. (2015), "What Library 2.0 has taught libraries in Taiwan about e-learning", *The Electronic Library,* Vol. 33 Iss. 6, pp. 1121-1132.

Kumar, A. (2014), "Students' opinion about the success of mobile technology in libraries", *New Library World,* Vol. 115, 471-481.

Kwanya, T., Stilwell, C. and Underwood, P. G. (2012), "Library 2.0 versus other library service models: a critical analysis", *Journal of Librarianship and Information Science,* Vol. 44 No. 3, pp. 145-162.

Linnhoff, S. and Smith, K. T. (2016) "An examination of mobile app usage and the user's life satisfaction", *Journal of Strategic Marketing***,** pp. 1-37.

Liu, Y. Q. and Briggs, S. (2015), "A library in the palm of your hand: mobile services in top 100 university libraries", *Information Technology and Libraries,* Vol. 34 No. 2**,** 133-148.

Maness, J. M. (2006), "Library 2.0 theory: Web 2.0 and its implications for libraries", *Webology,* Vol. 3 No. 2.

Martindale et al (2015), "Use and perceptions of e-books in Derbyshire libraries", *Library Review,* Vol. 64 No. 1/2, pp. 2-20.

Merrett, N. (2016), "26 Scottish authorities back shared chief digital officer plan - Government Computing Network", available at: http://devolved.governmentcomputing.com/news/26-scottish-authorities-back-shared-chief-digital-officer-plan-4906447 (accessed 24 November 2016).

Mills, K. (2009), "M-Libraries: information on the move", available at: http://arcadiaproject.lib.cam.ac.uk/docs/M-Libraries_report.pdf (accessed 24 November 2016).

National Library Of Scotland (2016), "National Library of Scotland | Facebook", available at: https://www.facebook.com/NationalLibraryOfScotland (accessed 24 November 2016).

National Records Of Scotland Web Team (2016), "Mid-2015 population estimates Scotland and corrected population estimates for mid-2012, mid-2013 and mid-2014", available at: http://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-estimates/mid-year-population-estimates/mid-2015-and-corrected-mid-2012-to-mid-2014 (accessed 2016).

Noh, Y. (2013), "A study on next-generation digital library using context-awareness technology", *Library Hi Tech,* Vol. 31 Iss. 2, pp. 236-253.

Ofcom (2016), "Scotland becomes a 'smartphone society'", available at: http://media.ofcom.org.uk/news/2015/cmr-scotland-2015/ (accessed 24 November 2016).

Ong, I., Goh, C., Chua, L. and Pak, P. (2014), "Empowering the library patron: The public libraries of Singapore's experience with transactional services delivered through a mobile application", available at: http://library.ifla.org/906/1/210-ong-en.pdf (accessed 24 November 2016).

Peachey, J. (2017), "Shining a light: How people in the UK and Ireland use public libraries and what they think of them", available at: https://www.carnegieuktrust.org.uk/carnegieuktrust/wp-

content/uploads/sites/64/2017/04/LOW-RES-2867-Libraries-Main-Report-Complete-1.pdf (accessed 2017).

Pew Research Center (2015), "Cell phones in Africa: communication lifeline", available at: http://www.pewglobal.org/2015/04/15/cell-phones-in-africa-communication-lifeline/ (accessed 24 November 2016).

Rasmussen Pennington, D. (2016, July/August), "Demystifying linked data: are you ready for what's next?", *CILIP Update*, 34-36.

Kane, K., Robinson-Combre, J. and Berge, Z. L. (2010), "Tapping into social networking: collaborating enhances both knowledge management and e-learning", *VINE,* Vol. 40 No. 1, pp. 62-70.

Society Of Chief Librarians (2016), "Annual Report 2015/16", available at: http://goscl.com/wp-content/uploads/SCL-Annual-Report-2015-16.pdf (accessed 24 November 2016).

Sofaer, S. (1999), "Qualitative methods: what are they and why use them?", *Health Services Research,* Vol. 34 (5 Pt 2)**,** pp. 1101-1118.

Spence, E. (2014 April), "The mobile browser is dead, long live the app", *Forbes*, available at http://www.forbes.com/sites/ewanspence/2014/04/02/the-mobile-browser-is-dead-long-live-the-app/#6f8230a16e7d (accessed 24 November 2016).

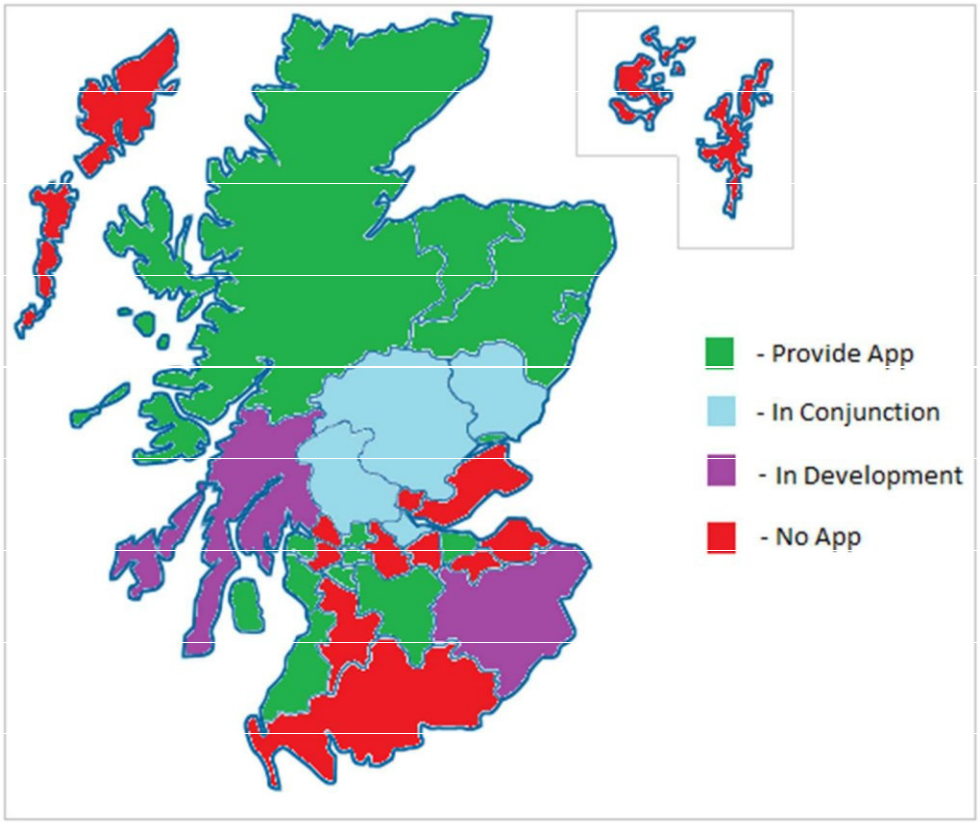
The British Library (2016), "The British Library", available at: https://www.youtube.com/user/britishlibrary (accessed 24 November 2016).

W3C (1999), "Resource Description Framework (RDF) model and syntax specification", available at: http://www.w3.org/TR/1999/REC-rdf-syntax-19990222/ (accessed 24 November 2016).

W3C (2013), "W3C Semantic Web Activity Homepage", available at: http://www.w3.org/2001/sw/ (accessed 24 November 2016).

Walia, P. K. and Gupta, M. (2012), "Application of Web 2.0 tools by national libraries", *Webology,* Vol. 9 No. 1.

Yang, X., Wei, Q. and Peng, X. (2009), "System architecture of Library 2.0", *The Electronic Library,* Vol. 27 No. 2**,** pp. 283-291.


- Provide App
- In Conjunction
- In Development
- No App

Feature	Yes	Percentage (%)	Under Development	Percentage (%)	No	Percentage (%)	Total Response
Library Locations	16	88.9	0	11.1	2	0.0	18
Library Catalogue	16	88.9	0	11.1	2	0.0	18
Reserve/renew Loaned Items	16	88.9	0	11.1	2	0.0	18
Opening Hours	15	88.2	0	11.8	2	0.0	17
Audio-books	14	77.8	2	11.1	2	11.1	18
Social Media	11	73.3	2	13.3	2	13.3	15
Library Events	10	71.4	3	7.1	1	21.4	14
E-books	12	66.7	1	27.8	5	5.6	18
E-magazines	12	66.7	3	16.7	3	16.7	18
E-databases (e.g. CREDO or ProQuest)	10	58.8	4	17.7	3	23.5	17
Local Events	8	57.1	5	7.1	1	35.7	14
Local Heritage	7	43.8	8	6.3	1	50.0	16
DVD/Blu-ray	6	40.0	8	6.7	1	53.3	15
Music	5	35.7	6	21.4	3	42.9	14
Computer Booking	3	23.1	9	7.7	1	69.2	13
Council Services	2	14.3	11	7.1	1	78.6	14
Health Services	1	6.7	13	6.7	1	86.7	15
Other Bodies (e.g. Citizens' Advice)	1	6.7	13	6.7	1	86.7	15
Ask A Librarian Service	0	0.0	11	21.4	3	78.6	14
Inter-regional Loans	0	0.0	12	7.7	1	92.3	13
Room Booking	0	0.0	13	7.1	1	92.9	14
Tutor Booking	0	0.0	13	7.1	1	92.9	14
Government Services	0	0.0	13	7.1	1	92.9	14
National Institutions	0	0.0	13	7.1	1	92.9	14
Recommended Apps	0	00	13	7.1	1	92.9	14